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B 2 9 D 31/00		B 2 9 D 31/00	2 H 0 3 2
B 2 9 C 67/20		B 2 9 C 67/20	P 2 H 0 3 4
F 1 6 C 13/00		F 1 6 C 13/00	E 2 H 0 7 7
G 0 3 G 15/08	5 0 1	G 0 3 G 15/08	5 0 1 D 5 1 1 0 8
15/16	1 0 8	15/16	1 0 8 4 F 2 1 2

審査請求 未請求 請求項の数 8 O L (全 7 頁) 最終頁に続く

(21) 出願番号 特願2000-38876 (P2000-38876)

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(74) 代理人 100076732

弁護士 大谷 保

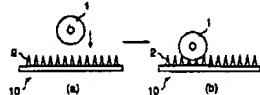
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(54) 発明の名称 発泡体ローラの製造方法及び画像形成装置

(57) 要約

【課題】 表面にスキン層を有する発泡体ローラを加工し、特に画像形成装置に用いられるトナー供給ローラとして好適な、トナー供給性能に優れ、安定してトナーを供給し得る発泡体ローラの製造方法を提供すること。

【解決手段】 回転軸と、その外周に設けられ、かつ表面にスキン層を有する発泡弾性体層からなるローラを、多数の針を具備した治具に接触させ、該針により、上記発泡弾性体層表面のスキン層を全面にわたって均質に穿孔する。



PUBN-DATE: June 18, 2002

INVENTOR-INFORMATION:

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ASSIGNEE-INFORMATION:

NAME BRIDGESTONE CORP COUNTRY N/A

APPL-NO: JP2000369976

APPL-DATE: December 5, 2000

INT-CL (IPC): B29D031/00; B29C067/20; F16C013/00; G03G015/08; G03G015/16; G03G021/10

ABSTRACT:

PROBLEM TO BE SOLVED: To provide a method for manufacturing a foamed roller suitable as a toner supply roller used particularly for an image forming apparatus, by processing the roller having a skin layer on its surface, having an excellent toner supply performance, and being capable of stably supplying a toner.

SOLUTION: The method for manufacturing the foamed roller comprises the steps of contacting the roller having a rotational shaft and a foamed elastic layer provided on its outer periphery and having the skin layer on a surface with a jig having many needles, and homogeneously entirely circumferentially perforating the skin layer on the surface of the elastic layer by the needles.

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	1	U	Current	Current X	Pa	Document 1	Title
1	<input type="checkbox"/>	<input type="checkbox"/>	399/53	399/272	14	US 6341204	Development apparatus employing t
2	<input type="checkbox"/>	<input type="checkbox"/>	264/321	264/156	4	US 3742110	METHOD OF SHAPING BRITTLE F
3	<input type="checkbox"/>	<input type="checkbox"/>			6	JP 2002172	METHOD FOR MANUFACTURING
4	<input type="checkbox"/>	<input checked="" type="checkbox"/>			7	JP 2002172	METHOD FOR MANUFACTURING
5	<input type="checkbox"/>	<input checked="" type="checkbox"/>				JP 2002166	METHOD FOR MANUFACTURING
6	<input type="checkbox"/>	<input checked="" type="checkbox"/>				JP 2002113	METHOD FOR MANUFACTURING
7	<input type="checkbox"/>	<input checked="" type="checkbox"/>				JP 2001121	METHOD OF MANUFACTURING E

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(10) 日本国特許庁 (J P) (12) 公開特許公報 (A) (11) 特許出願公開番号  
特開2002-172711  
(P2002-172711A)  
(43) 公開日 平成14年6月18日 (2002.6.18)

(51) Int. Cl.<sup>7</sup> 識別記号 F I 5-12-3 (参考)  
B 29 D 31/00 B 29 D 31/00 2 H 0 0 3  
B 29 C 67/20 B 29 C 67/20 F 2 H 0 3 2  
F 16 C 15/00 F 16 C 15/00 E 2 H 0 3 4  
A 2 H 0 7 7  
G 03 G 15/02 1 0 1 G 03 G 15/02 1 0 1 2 F 3 4 8  
審査請求 未請求 請求項の数 5 O L (全 6 頁) 最終頁に続く

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(34) 発明の名称 発泡体ローラの製造方法及び画像形成装置

(57) 【要約】  
【課題】 表面にスキン層を有する発泡体ローラの該スキン層を簡単な方法で剥離させ、画像形成装置に用いられるトナー供給ローラなどとして有用なスキン層のない発泡体ローラを効率よく製造する方法を提供すること。  
【解決手段】 固形剤と、その外周に設けられ、かつ表面にスキン層を有する発泡弾性体層からなるローラの該スキン層を、非接触方式の熱処理により溶融消滅させる。

PUBN-DATE: June 18, 2002

INVENTOR-INFORMATION:

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TAKAHASHI, WATARU N/A  
KUSANO, AKIRA N/A

ASSIGNEE-INFORMATION:

NAME BRIDGESTONE CORP COUNTRY N/A

APPL-NO: JP2000370889

APPL-DATE: December 6, 2000

INT-CL (IPC): B29D031/00; B29C067/20; F16C013/00; G03G015/02; G03G015/08; G03G015/16; G03G021/10; B65H003/06

ABSTRACT:

PROBLEM TO BE SOLVED: To provide a method for efficiently manufacturing a foamed roller having no useful skin layer as a toner supply roller or the like used for an image forming apparatus, by disappearing the skin layer of the roller having the skin layer on its surface by a simple method.

SOLUTION: The method for manufacturing the foamed roller comprises the step of heat treating in a non-contact type the skin layer of the roller having a rotational shaft and a foamed elastic layer provided on its outer periphery and including the skin layer on the surface to melt to disappear the skin layer.

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	1	U	Current	Current X Pa	Document 1	Title
1	<input type="checkbox"/>	<input type="checkbox"/>	399/53	399/272	14	US 6341204 Development apparatus employing t
2	<input type="checkbox"/>	<input type="checkbox"/>	264/321	264/156	4	US 3742110 METHOD OF SHAPING BRITTLE F
3	<input type="checkbox"/>	<input checked="" type="checkbox"/>			6	JP 2002172 METHOD FOR MANUFACTURING
4	<input type="checkbox"/>	<input checked="" type="checkbox"/>				JP 2002172 METHOD FOR MANUFACTURING
5	<input type="checkbox"/>	<input checked="" type="checkbox"/>				JP 2002166 METHOD FOR MANUFACTURING
6	<input type="checkbox"/>	<input checked="" type="checkbox"/>				JP 2002113 METHOD FOR MANUFACTURING
7	<input type="checkbox"/>	<input checked="" type="checkbox"/>				JP 2001121 METHOD OF MANUFACTURING E

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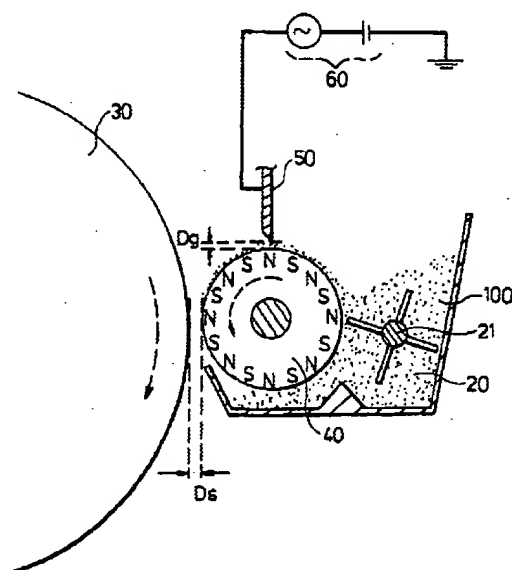
U.S. Patent

Oct. 15, 1996

Sheet 2 of 2

5,565,966

FIG. 2



US-PAT-NO: 5565966

DOCUMENT-IDENTIFIER: US 5565966 A

TITLE: Image forming method for setting a developing gap

----- KWIC -----

The sleeveless magnet roller 40 to be used in the present invention is obtained by kneading a raw material in which magnetic powder (e.g., ferrite powder or ferromagnetic powder of rare earth magnets), sulphur, and vulcanization accelerator, further conductive agents (e.g., carbon black and carbon fiber) according to the need, are added to a rubber material (e.g., urethane rubber, silicone rubber, and butyl rubber), followed by casting, vulcanization, outer grinding, and magnetizing. In addition, for the present invention, an isotropic magnet roller is also available which is made up by projecting or extruding a kneaded material mainly comprising thermoplastic resin (polyamide, ethylene vinyl acetate copolymer, ethylene ethyl acrylate copolymer, or the like) and magnetic power (preferably 50 to 90 wt %).

The sleeveless magnet roller 40 to be used in the embodiment 2 is a magnet roller with 32 poles symmetrically fitted, obtained by kneading and projecting a compound in which a 90:10 ratio of isotropic Ba ferrite powder as magnetic power and nylon-6 are mixed, whose surface magnetic flux density is 200G. Besides nylon resin mentioned above, polyurethane resin, ethylene ethyl acrylate resin and the like, or plastic having some elasticity to exert no stress on toner may be employed as resin for the sleeveless magnet roller 40.

	U	Current	Current X	Pa	Document I	Title
6	<input type="checkbox"/>	430/55	399/130;	9	US 5879846	Image forming process and apparab
7	<input type="checkbox"/>	430/125	399/359;	30	US 5849453	Image forming method including rec
8	<input type="checkbox"/>	430/102	430/111 4;	28	US 5888622	Developing method
9	<input type="checkbox"/>	399/267	399/272;	8	US 5634182	Method of developing electrostatic l
10	<input type="checkbox"/>	430/108	430/109 4;	8	US 5622802	Toner for electrostatic latent image c
11	<input type="checkbox"/>	399/176	399/149;	27	US 5587774	Cleanerless electrographic imaging
12	<input checked="" type="checkbox"/>	399/274	399/270;	10	US 5565966	Image forming method for setting a

# United States Patent [27]

Okada et al.

(11) Patent Number: **5,655,197**

(45) Date of Patent: Aug. 5, 1997

[54] **DEVELOPING DEVICE** 5,177,323 1/19/93 European Pat. Off. 118/053  
5,179,414 1/19/93 European Pat. Off. 118/053  
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[75] Inventors: Hidetoshi Okada; Yoshio Koga; Takashi  
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Japan

[73] Assignee: Saito Kasei Corporation, Tokyo,  
Japan

[21] Appl. No.: 847,599

[22] Filed: Oct. 24, 1994

Related U.S. Application Data

[62] Division of Ser. No. 70,181, Jan. 2, 1993, Pat. No. 5,257,  
005.

[60] Foreign Application Priority Data

Jan. 2, 1993 Japan 4-241424

May 11, 1993 Japan 5-109028

[51] Int. Cl.<sup>4</sup> G03G 15/06

[52] U.S. Cl. 118/060; 355/259

[56] Field of Search 355/261; 118/051; 653; 661

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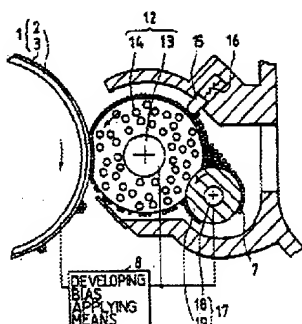
4,930,434 6/29/90 Dennis et al. 118/051  
4,852,231 10/1990 Hasegawa et al. 355/219  
5,012,319 4/1991 Akashi et al. 355/259  
5,085,728 2/1992 Kikuchi et al. 118/053  
5,097,594 3/1992 Nishio et al. 355/243  
5,143,530 8/1992 Rimee et al. 355/259  
5,170,213 12/1992 Yamaguchi et al. 355/246

Primary Examiner—Robert Henry  
Attorney, Agent, or Firm—Sugata, Mito, Zita, Macpeak  
& Soni

## ABSTRACT

A developing device including a supply member pressing  
contacted with a toner carrier, wherein the supply member  
has a hardness which is greater than that of the toner carrier.  
The supply member is rotated in the same direction as the  
toner carrier to conduct the pressing and supply of toner. A  
plate spring-like regulation member is pressed against the  
toner carrier to change the toner to a predetermined polarity  
and this film toner layer on two layers. The toner carrier  
is made of a foam material.

34 Claims, 6 Drawing Sheets



charge control agent include a metallic complex salt, and a quaternary ammonium salt.

## Detailed Description Text - DETX (21):

FIG. 6 is a diagram of a developing device which is another embodiment of the invention. A blade-like or cylindrical regulation member 15 made of a non-magnetic or magnetic metal or a resin is urged by press means 16 using an elastic body such as a spring or rubber, against a toner carrier 12 for carrying toner 7. This causes the regulation member 15 to be elastically deformed so that, at the contacting area of the toner carrier 12, the toner 7 is triboelectrically charged to have a predetermined polarity, and thinned so that one or two toner layers are formed. At least the surface of the toner carrier 12 is formed by a foamed member having a hardness of 40 degree. (JIS A) or less. When pressed by a rigid body, the toner carrier 12 is easily deformed. Similarly, when the toner carrier 12 is formed by a foamed member having a hardness of 40 degree. (JIS A) or less, a development nip length of 1 mm or longer can be obtained even in the case of a low developing pressure of 5 gf/mm or less, thereby allowing the soft contact developing process to be stably conducted. The toner carrier 12 comprises a foamed member 14 which is formed on the outer surface of a shaft 13 made of a metal or resin and which has foam cells of several tens to one thousand microns. In the embodiment, the foamed member 14 is formed by a polyurethane foam. Alternatively, the foamed member 14 may be made of another foam in the same manner as the foamed member 28 of the supply member 26 described above. A supply member 17 comprises a cylindrical solid member 19 made of a metal, resin or hard rubber and formed on the outer surface of a shaft 18 made of a metal or resin. The surface roughness of the supply member 17 is several tens microns.

## Current US Original Classification - CCOR (1):

399/281

## Current US Cross Reference Classification - CCXR (1):

Current X Pa Document	Title
1 399/286 26 US 5655197	Developing device
2 399/285 26 US 5557060	Developing device
3 492/53 20 US 5424815	Developing device

U.S. Patent

June 13, 1995

Sheet 6 of 7

5,424,815

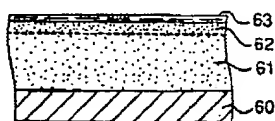


FIG. 6 (a)



FIG. 6 (b)

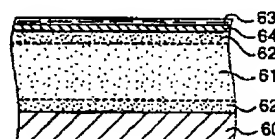


FIG. 6 (c)

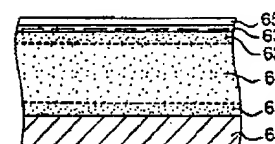


FIG. 6 (d)

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Detailed Description Text - DETX (14):

FIG. 6(a) is a schematic cross-sectional view of an embodiment of the developing device according to the present invention wherein a magnetic field generating layer is provided on the surface of a toner carrier. In this embodiment, a foam portion 61 and a solid surface layer portion 62 are provided in that order on a base 60, such as a shaft, and a magnetic field generating layer 63 is provided on the solid surface layer portion 62. When the magnetic field generating layer 63 is provided on the outer periphery of the toner carrier in this manner, the magnetic toner can be held on the toner carrier by means of magnetic force and stably transported, so that the scattering of the toner can be prevented. Further, at the time of the development, the occurrence of fogging can be reduced through the generation of the development inhibitory force by the magnetic force against the developing force by the developing electric field. Further, it is also possible to attain a development electrode effect by making the magnetic field generating layer 63 electroconductive. The thickness of the magnetic field generating layer 63 is preferably 100  $\mu\text{m}$  or less from the viewpoint of ensuring ample flexibility. With respect to the material for the magnetic field generating layer 63, the dispersion of a ferromagnetic fine powder in substantially the same resin as that in the foam portion 61 contributes to an improvement in the bonding strength between the solid surface layer portion 62 and the magnetic field generating layer 63. An even layer can be formed as the magnetic field generating layer 63 through the use of spray coating, transfer coating, in-mold coating, roller coating, electroless plating or the like. The ferromagnetic material for the magnetic field generating layer 63 may be any material known as a magnetic recording material and a magnetic material. Specific examples thereof include a magnetic material containing at least one element selected from Fe, Ni, Co, Mn and Cr, for example,  $\gamma\text{-Fe}_2\text{O}_3$ ,  $\text{Ba-Fe}$ ,  $\text{Ni-Co}$ ,  $\text{Co-Cr}$  and  $\text{Mn-Al}$ . The demagnetization of the magnetic field generating layer 63 caused by a magnetic toner and a magnetically soft component around the developing device can be prevented by applying a coercive force of 2000 Oe or more.

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	Current X (Pa)	Document	Title
1	399/286	26 US 6656197	Developing device
2	399/285	26 US 5557060	Developing device
3	492/53	20 US 5424815	Developing device

Details Text Image HTML



US 6,324,372 B1

(12) United States Patent  
Hirota

(20) Patent No.: US 6,324,372 B1  
(45) Date of Patent: Nov. 27, 2001

(54) MAGNET ROLLER, PROCESS FOR PRODUCING SAME AND DEVELOPING UNIT USING SAME

06-162230 \* 6/1996 (JP)

\* cited by examiner

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Primary Examiner—Arthur T. Grimsley

(73) Assignee: Bridgstone Corporation, Tokyo (JP)

Assistant Examiner—Helen Tran  
(74) Attorney, Agent, or Firm—O'Brien, Sprague, McCullough, Maiter & Neustadt, P.C.

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(57) ABSTRACT

There are disclosed a magnet roller which includes a magnet main body portion and a shaft portion, wherein the magnet main body portion includes a composition for magnets and has at least one hollow portion in the inside thereof, a process for producing a magnet roller having a magnet main body portion and a shaft portion, which includes arranging in advance, at least one member for forming a hollow portion in a cavity of a mold which has generated a magnetic field on the circumference of the cavity, forming a composition for magnets into the mold, and thereafter withdrawing the member for forming the hollow portion so that at least one hollow portion is formed in the inside of the magnet roller, and a developing unit which includes a developing roller constituted of a sleeve installed in a freely rotatable manner and the above magnet roller installed inside the sleeve. The magnet roller can be produced at a low cost owing to curtailed use quantity of a composition for magnets, can suppress the lowering of magnetic force due to voids on the outside periphery thereof, and is favorably employed, for instance, in image forming equipment such as copying machinery, printers and facsimile machinery.

(21) Appl. No. 09/555,591

(22) Filed: Apr. 20, 2000

(30) Foreign Application Priority Data

Apr. 27, 1999 (JP) 11-119908

(51) Int. Cl.<sup>7</sup> G03G 15/09

(52) U.S. Cl. 399/277

(58) Field of Search 399/277, 257, 399/279, 286; 492/4, 16, 436/36-8, 35/52, 39/655

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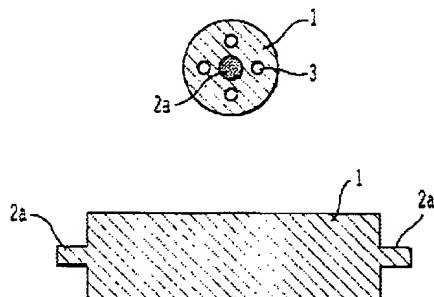
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6,132,634 \* 10/2000 Nakamura et al. 492/8

FOREIGN PATENT DOCUMENTS

06-162230 \* 6/1996 (JP)

11 Claims, 1 Drawing Sheet



US-PAT-NO: 6324372

DOCUMENT-IDENTIFIER: US 6324372 B1

TITLE: Magnet roller, process for producing same and developing unit using same

----- KWIC -----

In regard to a process for producing such a magnet roller, there is prevalently employed a process which comprises molding a magnet main body portion by injection molding or extrusion molding of a composition for magnets in which magnetic powders are mixed with a thermoplastic resin binder composed principally of nylon or polypropylene, by the use of a mold which has generated a magnetic field on the circumference of a cavity thereof to mold the composition into the form of a roller and magnetize to desired magnetic force characteristics.

399/277

1	U	Current	Current X	Pa	Document	Title
1		252/62.5	252/62.55	7	US 6342167	Synthetic resin magnet composition
2		399/277		6	US 6324372	Magnet roller, process for producing
3		399/104		17	US 6160978	Developing device having magnetic
4		399/104	399/106	9	US 6151467	Developing apparatus
5		399/277	335/296	15	US 6021296	Magnet roller and manufacturing met
6		399/277	492/18	7	US 5948535	Magnet roller and developing roller u
7		335/284	399/277	9	US 5659280	Apparatus and system for magnetiz
8						

1

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the magnetic toad particles have a weight-average particle diameter of from 3.5 to 6.5  $\mu$ m; and a dispersion prepared by dispersing 15 mg of the magnetic toad particles in 10 ml of a mixed solution of ethyl alcohol and water in a volume ratio of 2:7:73 has an absorbance of from 0.2 to 0.7 at a wavelength of 600 nm.

the magnetic layer comprising magnetic ions; particles containing at least a binder resin, a magnetic fine powder and a glass substrate;

the magnetic toner particles have a weight-average particle diameter of from 3.5 to 6.5  $\mu\text{m}$ ; and a dispersion prepared by dispersing 15 mg of the magnetic toner particles in 19 ml of a mixed solution of ethyl alcohol and water in a volume ratio of 20:78 has an absorbance of from 0.2 to 0.5 at a wavelength of 600 nm.

The present invention further provides a process cartridge comprising an electrostatic image bearing member, a contact charging means for electrostatically charging the electrostatic image bearing member, and a developing means holding a magnetic toner.

the magnetic tower comprising magnetic tower particles containing at least a binder resin, a magnetic fluid

the magnetic tower particles have a weight-average particle diameter of from 3.5 to 6.5  $\mu\text{m}$ ; and a dispersion prepared by dispersing 1.5 mg of the magnetic tower particles in 19 ml of a mixed solution of ethyl alcohol and water in a volume ratio of 27:73 has an absorbance of from 0.2 to 0.7 at a wavelength of 600 m $\mu$ .

### BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 2 is a cross-sectional schematic illustration of the construction of a cylinder.

FIG. 3 shows a correlation between the resin temperature, the quantity of free magnetic fine particles and the dispersibility of wax.

FIG. 4 is a schematic illustration of an example of an electroreographic apparatus employing the magnetic force of the present invention.

FIG. 5 is a schematic illustration of a contact charging means preferably used in the present invention.

FIG. 6 is a schematic illustration of an example of the process particular of the present invention.

FIG. 8 is a perspective view of the main part of the gas stream classifier shown in FIG. 7.

FIG. 9 is a partial perspective view of the gas stream classifier shown in FIG. 7.

TABLE 1. *Continued*

FIG. 11 illustrates the main part of the gas stream classifier shown in FIG. 7.

FIG. 12 illustrates an example of a classification process used in the classification of magnetic latex particles.

used in the classification of magnetic laser particles.

### DESCRIPTION OF THE PREFERRED EMBODIMENTS

With regard to the contamination of the charging member which is a kind of contact charging means and the poor ink-adhesion to drum onto the surface of the photosensitive drum which is a kind of electrostatic image bearing member, some magnetic rollers tend to cause these problems and some may easily cause similar problems. Sordins were

made on how to simply find the difference between magnetic  
torques accounting for the former torques and magnetic  
torque particles constituting the latter torques, without relying  
on the omission by image reproduction. As a result, it has  
been found that such difference can be detected by a method  
using a dispersion prepared by dispersing magnetic torques

The fact that the dispersion has a high absorbance indicates that the magnetic iron particles stand readily available

by the aqueous solution and that magnetic fine powder is present in a large quantity on the surfaces of the magnetic toner particles. Such magnetic toner particles tend to liberate magnetic fine particles from their surfaces. In fact, when magnetic toners produced from such magnetic toner particles are evaluated by image reproduction, such problems as

charging roller contamination and melt-adhesion to photosensitive drum surface tend to occur. It has been ascertained that many magnetic fine particles are present in the contaminants on the charging roller surface and in the molten deposits on the photosensitive drum surface. This can be said to be a measuring method by which the quantity of

said to be a measuring method by which the quantity of magnetic fine powder present on the surfaces of the magnetic wear particles can be clearly and properly shown.

The magnetic tower particles used in the present invention have a weight-average particle diameter of from 3.5 to 6.5  $\mu$ m, and a dispersion prepared by dispersing 15 mg of the magnetic tower particles in 19 ml of a mixed solution of acryl alcohol and water (volume ratio 27:73) has an absorbance of from 0.2 to 0.7 at a wavelength of 600 nm.

As a device for measuring the magnetic particle diameter of

As a device for measuring the average particle diameter of the magnetic toner particles and magnetic toner by the Coulter counter method, a Coulter counter Model TA-II or Coulter Multisizer (manufactured by Coulter Electronics,

Inc.) is used. As an electrolytic solution, an aqueous 1% NaCl solution is prepared using best grade sodium chloride. For example, ISOTON R-11 (trade name, manufactured by

Center Scientific Japan Co.) may be used. Measurement is carried out by adding as a dispersant 0.1 to 5 ml of a surface active agent, preferably an alkylbenzene sulfonate, to 100 to 150 ml of the above aqueous emulsion solution and

150 ml. of the above aqueous electrolytic solution, and further adding 2 to 30 mg. of a sample to be measured. The electrolytic solution in which the sample has been suspended

is subjected to dispersion for about 2 minute to about 3 minutes in an ultrasonic dispersion machine. The volume

DOCUMENT-IDENTIFIER: US 6238834 B1

**TITLE:** Magnetic toner for developing electrostatic images, process for producing it, image forming method and process cartridge

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**Detailed Description Paragraph Table - DETL (14):**

TABLE 6 Image evaluation L/L H/H Form of contact Knead- Solid Molding Melt charging roller ing Ab-~~Magnetic~~ black Charging 1st sh. adhesion Rubber condi- sorb- fine powder image roller image to layer Surface layer tions ~~ions~~ .sigma.r.times. Hc W .times. R density fog contamination density drum

Example: 10 EPDM Nylon resin A 0.65 22 0.044 1.32 2.5 3.1 30 3 11 EPDM Nylon resin A 0.64 38 0.044 1.35 2.0 3.1 32 4 12 EPDM Nylon resin A 0.64 38 0.024 1.35 2.0 4 1.32 4 foam 13 EPDM Fluorine-cont. A 0.64 38 0.024 1.36 1.9 5 1.31 4 foam acrylic resin 14 EPDM Fluorine-cont. B 0.55 38 0.024 1.35 1.7 5 1.35 5 foam acrylic resin Comparative Example: 4 EPDM Nylon resin C 0.73 22 0.044 1.35 3.0 1.12 5 5 EPDM Nylon resin D 0.18 22 0.044 1.25 1.5 4 1.35 3

L/L: Low temperature/low humidity environment H/H: High temperature/high humidity environment

**Current US Cross Reference Classification - CCXR (1):**

393411







	1	U	Current	Current X	Pa	Document I	Title
1	F	F	430/106	399/111	31	US 6239834	Magnetic toner for developing elect
2	F	F	399/103	399/104	77	US 6185393	Developing apparatus, magnetic se
3	F	F	399/277	399/276	17	US 6125255	Magnet assembly with inserts and
4	F	F	399/286		8	US 6058285	Gloss and image forming apparatus
5	F	F	310/12	399/208	21	US 5808068	Linear motor apparatus employing li
6	F	F	399/120	399/123	14	US 5907752	Device for cleaning a photoconduc
7	F	F	399/281	399/286	26	US 5655197	Developing device

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# United States Patent (19)

Okada et al.

(11) Patent Number: 5,557,060  
(45) Date of Patent: Sep. 17, 1996

[56] DEVELOPING DEVICE 5,179,414 1/1993 Shogen ..... 353,219  
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[21] Appl. No.: 763,898

[22] Filed: Jun. 3, 1993

[30] Foreign Application Priority Data

Jun. 2, 1992 [JP] Japan ..... 4-141,424  
May 11, 1993 [JP] Japan ..... 5-129,281

[51] Int. Cl. G03G 15/06  
[52] U.S. Cl. 318/641; 355/259  
[53] Field of Search 355/259, 261;  
118/651, 661

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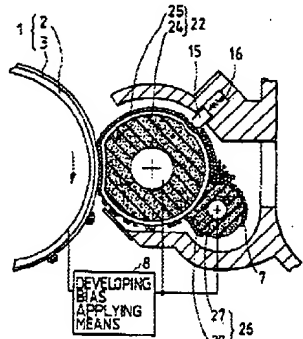
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## ABSTRACT

A developing device including a supply member pressingly  
contacted with a toner carrier having a hardness which is  
greater than that of the supply member and smaller than a  
predetermined hardness. The supply member is rotated in  
the same direction as the toner carrier to conduct the  
removing and supply of toner. A plate spring-like regulator  
member is pressed against the toner carrier to change the  
force to a predetermined polarity and thin the toner into one  
or two layers.

6 Claims, 6 Drawing Sheets



US-PAT-NO: 5557060

DOCUMENT-IDENTIFIER: US 5557060 A

TITLE: Developing device

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Detailed Description Text - DETX (10):

FIG. 2 is a diagram showing another toner carrier 22. A blade-like or cylindrical regulation member 15 made of a non-magnetic or magnetic metal or a resin is urged by press means 16 using an elastic body such as a spring or rubber, against a toner carrier 22 for carrying toner 7. This causes the regulation member 15 to be elastically deformed so that, at the contacting area of the toner carrier 12, the toner 7 is triboelectrically charged to have a predetermined polarity, and thinned so that one or two toner layers are formed. A foamed member 24 having foam cells of several tens to one thousand microns is formed on the outer surface of a shaft 23 made of a metal or a resin. A flexible layer 25 having a thickness of several tens to several hundreds microns is formed on the outer surface of the foamed member 24. The configuration in which the toner carrier 22 is constructed by the foamed member 24 and the thin flexible layer 25 having a surface of a low expansivity so as to attain the rubber hardness of 40 deg. (JIS A) or less can reduce the friction load between the foamed member 24 and the foamed member constituting the supply member 26. Moreover, the configuration enables the development nip length to be 1 mm or longer even in the case of a low developing pressure of 5 g/mm or less, thereby allowing the soft pressure developing process to be stably conducted. In the embodiment, the foamed member 24 is made of a polyurethane foam. Alternatively, the foamed member 24 may be made of another foam in the same manner as the foamed member 28 constituting the above-mentioned supply member 26. Particularly, flexible foams such as polyethylene, polyurethane, silicone, and neoprene are suitable as the material of the foamed member 24. Among these materials, a polyurethane foam is excellent in moldability and has a high hydrophilic property, and therefore it

Details Text Image HTML KWIC

Current X	Pa	Document	Title
1	399/286	26 US 6655197	Developing device
2	399/285	26 US 5557060	Developing device
3	492/53	20 US 5424815	Developing device

Details Text Image HTML Full